EXERCISES IN PHYSICAL CHEMISTRY

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AUTHOR'S PREFACE TO THE GERMAN EDITION

It may seem questionable whether there is any necessity for a new book on Practical Physical Chemistry, in view of the well-known books of Kohlrausch, Ostwald-Luther, and Wiedemann-Ebert. Nevertheless, my own teaching experience and those of my colleagues have proved to me that these books, though good in themselves, contain either too much, or too little, for the beginner. Consequently in this little book I have tried to provide something for the elementary student who is commencing to study the subject, for that purpose assuming as little previous knowledge as possible. I have tried to connect the training in experimental method with the theoretical conclusions derived from the results, and further to train the student to deduce his results correctly, and to comprehend the inner relationships between the data obtained from entirely different experiments.

This explains the reason that certain standard substances (as sodium chloride, silver nitrate, silver chloride, chloroform, and benzene) are suggested for use in exercises on quite independent work. I have laid special stress on the practical application of physical-chemical methods in quantitative analysis, and in the determination of the constitution of compounds. I have, however, not treated of electrolysis and spectrum analysis, since the student is supposed to be acquainted with these subjects from the course of analytical chemistry.

The book is in great part based on the *Kleine Practikum* of physical chemistry, which was arranged by Professor Nernst, in Göttingen and Berlin Universities, and which I had to conduct in Berlin.

The student is advised to read the first chapter thoroughly before proceeding to the actual measurements, since the subjects discussed in it relate to all the subsequent experiments. In order to make the book as compact as possible, lengthy deductions and complicated tables have been omitted. Further details on such fundamental physical measurements as weighing and different methods of calibration must be sought for in larger text-books of practical physics. More details concerning the theoretical deductions will be found in the well-known text-books of physical chemistry, especially in that of Nernst. The actual experimental results can be controlled by consulting one of the large volumes of tables. The books of Kohlrausch, Ostwald-Luther, Nernst, Ostwald, and Landolt-Börnstein are certain to be found in the library of every chemical laboratory.

In order to recall the fundamental laws to the memory of the beginner, qualitative experiments are described—in small type—at the beginning of most of the chapters; the greater part of these have been tested as lecture experiments.

Perhaps I may be reproached with the fact that I have treated many sections—*e.g.*, that on thermochemistry—with an undoubted preference, and more detailed consideration than others. But thermochemistry and thermodynamics are the framework of the whole of physical chemistry. Moreover, it is open to all to select from the exercises according to the time at their disposal.

The illustrations, which are reproduced from my sketches, are designedly quite simple and schematic diagrams, such as are drawn on the blackboard in a practical course. My thanks are due to my colleagues for all suggested alterations and additions.

W. A. ROTH.

GREIFSWALD,
December, 1906.

TRANSLATOR'S PREFACE

THE same reasons which made the publication of this volume desirable in Germany hold with equal force for the English edition.

The book has been revised throughout by the author, who has made numerous additions. The most important is that dealing with oxidation and reduction cells, and the mechanism of current production (Chapter XI.); others are concerned with Lippmann's electrometer, the electrical measurement of solubility, polarimetry, etc.

I have added a short chapter on the construction and use of the thermostat, and an appendix on the use of the electroscope in radio-active work.

The illustrations have been redrawn, and a few new ones added where desirable.

I have pleasure in expressing my thanks to the author for his kindness in reading the proof-sheets. Dr. N. T. M. Wilsmore has also kindly read a part of the proofs. I am indebted especially to Dr. Otto Brill, who gave me considerable assistance with the translation.

January, 1909.

PHYS. CHEM. INSTITUT,
TECHNISCHE HOCHSCHULE, KARLSRUHE.

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